What is claimed is:

1. A method for sensing, comprising:

interrogating at least one optical sensor;

interrogating at least one optical reference device co-located with the optical sensor;

extracting a sensor optical frequency parameter from a signal received from the sensor;

extracting a reference optical frequency parameter from a signal received from the reference device; and

generating a corrected sensor optical frequency parameter based on the sensor and reference optical frequency parameters.

2. The method of claim 1, wherein the optical sensor is sensitive to at least one measurand and the reference device is insensitive to the at least one measurand.

3. The method of claim 1, further comprising:

scaling the reference optical frequency parameter; and

wherein generating the corrected sensor optical frequency parameter comprises generating the corrected sensor optical frequency parameter based on the scaled reference optical frequency parameter and the sensor optical frequency parameter.

4. The method of claim 3, wherein scaling the reference optical frequency parameter comprises multiplying the reference optical frequency parameter by a scaling factor based on a ratio of a frequency of a light signal used to interrogate the sensor and a frequency of a light signal used to interrogate the reference device.

5. The method of claim 1, wherein at least one of the optical sensor and the reference device comprises an optical waveguide Bragg grating.

6. The method of claim 5, wherein the optical sensor and the reference device each comprise a Bragg grating optically coupled to a common lead waveguide.

7. The method of claim 5, wherein at least one of the sensor optical frequency parameter and the reference optical frequency parameter comprises a change in an optical waveguide Bragg grating center frequency.

8. The method of claim 1, wherein at least one of the optical sensor and the reference device comprises a sensor laser and at least one of the sensor optical frequency parameter and the reference optical frequency parameter comprises at least one of a laser frequency or a separation in laser frequencies.

9. The method of claim 1, further comprising locating the at least one optical sensor and the at least one optical reference device in a wellbore.

10. A method for sensing at least one parameter comprising:

interrogating a sensor interferometer to generate a sensor signal responsive to the parameter;

interrogating a reference interferometer co-located with the sensor interferometer to generate a reference signal insensitive to the parameter;

extracting a sensor phase from the sensor signal;

extracting a reference phase from the reference signal; and

generating a corrected sensor phase based on the sensor phase and the reference phase.

11. The method of claim 10, wherein the sensor interferometer and reference interferometer share a common lead optical waveguide.

12. The method of claim 10, wherein generating a corrected sensor phase based on the sensor phase and the reference phase comprises:

scaling the reference phase; and

generating the corrected sensor phase based on the sensor phase and the scaled reference phase.

13. The method of claim 12, wherein:

the sensor interferometer and reference interferometer are interrogated with light signals of different frequencies; and

scaling the reference phase comprises multiplying the reference phase by a scale factor determined by a ratio of the different frequencies.

14. The method of claim 12, wherein:

the sensor interferometer and reference interferometer have different interferometer imbalances; and

scaling the reference phase comprises multiplying the reference phase by a scale factor determined by a ratio of the different interferometer imbalances.

15. A method comprising:

interrogating an optical sensor to generate a sensor signal;

interrogating optical reference device co-located with the sensor to generate a reference signal; and

correcting the sensor signal for errors due to Doppler shifts based on the reference signal.

16. The method of claim 15, wherein the reference device and sensor share a common lead optical waveguide.

17. The method of claim 15, wherein the reference device and sensor comprise distributed lasers.

18. The method of claim 15, wherein the reference device and sensor comprise interferometers.

19. The method of claim 15, wherein at least one of the reference and sensor comprises an optical waveguide Bragg grating.

20. A sensor system, comprising:

a light source for generating interrogating light signals;

at least one optical sensor optically coupled with the light source;

at least one optical reference device co-located with the sensor and optically coupled with the light source; and

control circuitry configured to interrogate the sensor with light from light source to generate a sensor signal, interrogate the reference device with light from the light source to generate a reference signal, extract a sensor optical frequency parameter from the sensor signal, extract a reference optical frequency parameter from the reference signal, and generate a corrected sensor optical frequency parameter based on the sensor and reference optical frequency parameters.

21. The system of claim 20, wherein the at least one optical reference comprises a sensor laser and the reference optical frequency parameter comprises a laser mode frequency.

22. The system of claim 20, wherein the at least one optical reference comprises an optical waveguide Bragg grating and the reference optical frequency parameter comprises a change in center frequency of the optical waveguide Bragg grating.

23. The system of claim 20, wherein the reference and sensor share a common lead waveguide.

24. The system of claim 20, wherein the control circuitry is configured to scale the reference optical frequency parameter and generate the corrected sensor optical frequency parameter based on the scaled reference optical frequency parameter from the sensor optical frequency parameter.

25. The system of claim 24, wherein the control circuitry is configured to scale the reference optical frequency parameter by multiplying the reference optical frequency parameter by a scaling factor based on a ratio of a frequency of a light signal used to interrogate the sensor and a frequency of a light signal used to interrogate the reference device.

26. The system of claim 20, wherein at least one of the optical sensor and the reference device comprises a sensor laser and at least one of the sensor optical frequency parameter and the reference optical frequency parameter comprises at least one of a laser frequency or a separation in laser frequencies.

27. A sensor system for sensing at least one parameter, comprising:

a light source for generating interrogating light signals;

at least one sensor interferometer sensitive to the downhole parameter;

at least one reference interferometer co-located with the sensor interferometer and configured to be insensitive to the downhole parameter; and

control circuitry configured to interrogate the sensor interferometer with light from light source to generate a sensor signal, interrogate the reference interferometer with light from the light source to generate a reference signal, extract a sensor phase from the sensor signal, extract a reference phase from the reference signal, and generate a corrected sensor phase based on the extracted sensor and reference phases.

28. The system of claim 27, wherein:

the at least one sensor interferometer and the at least one reference interferometer are co-located in a wellbore; and

the at least one parameter comprises at least one parameter in the wellbore.

29. The system of claim 27, wherein the sensor interferometer and reference interferometer share a common lead waveguide.

30. The system of claim 27, wherein the control circuitry is configured to scale the reference phase and generate the corrected sensor phase based on the sensor phase and the scaled reference phase.

31. The system of claim 30, wherein:

the sensor interferometer and reference interferometer are interrogated with light signals of different frequencies; and

the control circuitry is configured to scale the reference phase by multiplying the reference phase by a scale factor determined by a ratio of the different frequencies.

32. The system of claim 30, wherein:

the sensor interferometer and reference interferometer have different interferometer imbalances; and

the control circuitry is configured to scale the reference phase by multiplying the reference phase by a scale factor determined by a ratio of the different interferometer imbalances.